

WHAT IS CLAIMED IS:

1. A dielectric film structure having a substrate and a dielectric film provided on said substrate, wherein

5        said dielectric film has (001) face orientation with respect to said substrate; and

         a value  $u$  in the following equation (1) regarding said dielectric film is a real number greater than 2:

10         $u = (C_c/C_a) \times (W_a/W_c) \quad \dots (1)$

         where,  $C_c$  is a count number of a peak of a (001') face of said dielectric film in an Out-of-plane X ray diffraction measurement (here,  $l'$  is a natural number selected so that  $C_c$  becomes maximum);  $C_a$  is a count  
15        number of a peak of a ( $h'00$ ) face of said dielectric film in an In-plane X ray diffraction measurement (here,  $h'$  is a natural number selected so that  $C_c$  becomes maximum);  $W_c$  is a half-value width of a peak of the (001') face of said dielectric film in an Out-  
20        of-plane rocking curve X ray diffraction measurement; and  $W_a$  is a half-value width of a peak of the ( $h'00$ ) face of said dielectric film in an In-plane rocking curve X ray diffraction measurement.

25        2. A dielectric film structure according to claim 1, wherein, in said dielectric film, a count number of faces other than a (001) face is smaller

than 10% of a count number of the (001') face in the Out-of-plane X ray diffraction measurement and a count number of faces other than a (h00) face is smaller than 10% of a count number of the (h'00) face  
5 in the In-plane X ray diffraction measurement (here, h and l are any natural numbers and l' is a natural number selected so that the count number of the peak of the (001') face becomes maximum in the Out-of-plane X ray diffraction measurement and h is a  
10 natural number selected so that the count number of the peak of the (h'00) face becomes maximum in the In-plane X ray diffraction measurement).

3. A dielectric film structure according to  
15 claim 1, wherein a thickness of said dielectric film is greater than 10 nm and smaller than 20  $\mu\text{m}$ .

4. A dielectric structure according to claim 1,  
wherein a crystal structure of said dielectric film  
20 is square crystal.

5. A dielectric film structure having a substrate and a dielectric film provided on said substrate, wherein  
25 said dielectric film has (111) face orientation with respect to the substrate; and  
a value v in the following equation (2)

regarding said dielectric film is a real number greater than 2:

$$v = (C_{111}/C_{-110}) \times (W_{-110}/W_{111}) \quad \dots (2)$$

where,  $C_{111}$  is a count number of a peak of a (111) face of said dielectric film in an Out-of-plane X ray diffraction measurement;  $C_{-110}$  is a count number of a peak of a (-110) face of said dielectric film in an In-plane X ray diffraction measurement;  $W_{111}$  is a half-value width of a peak of the (111) face of said dielectric film in an Out-of-plane rocking curve X ray diffraction measurement; and  $W_{-110}$  is a half-value width of a peak of the (-110) face of said dielectric film in an In-plane rocking curve X ray diffraction measurement.

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6. A dielectric film structure according to claim 5, wherein, in said dielectric film, a count number of faces not parallel to the (111) face is smaller than 10% of a count number of the (111) face in the Out-of-plane X ray diffraction measurement and a count number of faces not parallel to the (-110) face is smaller than 10% of a count number of the (-100) face in the In-plane X ray diffraction measurement.

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7. A dielectric structure according to claim 1, wherein a crystal structure of said dielectric film

is rhombic crystal.

8. A dielectric film structure having a substrate and a dielectric film provided on said substrate, wherein:

said dielectric film has (110) face orientation with respect to said substrate; and

a value  $w$  in the following equation (3) regarding said dielectric film is a real number greater than 2:

$$w = (C_{110}/C_{00m}) \times (W_{00m}/W_{110}) \quad \dots (3)$$

where,  $C_{110}$  is a count number of a peak of a (110) face of said dielectric film in an Out-of-plane X ray diffraction measurement;  $C_{00m}$  is a count number of a peak of a (00m) face of said dielectric film in an In-plane X ray diffraction measurement (here,  $m$  is a natural number selected so that  $C_{00m}$  becomes maximum);  $W_{110}$  is a half-value width of a peak of the (110) face of said dielectric film in an Out-of-plane rocking curve X ray diffraction measurement; and  $W_{00m}$  is a half-value width of a peak of the (00m) face of said dielectric film in an In-plane rocking curve X ray diffraction measurement.

9. A dielectric film structure according to claim 8, wherein, in said dielectric film, a count number of faces not parallel to the (110) face is

smaller than 10% of a count number of the (110) face  
in the Out-of-plane X ray diffraction measurement and  
a count number of faces not parallel to the (-110)  
face is smaller than 10% of a count number of the (-  
5 110) face in the In-plane X ray diffraction  
measurement.

10 10. A piezoelectric actuator comprising:  
a dielectric film structure according to claim  
1; and  
an electrode for applying voltage to said  
dielectric film structure.

15 11. A piezoelectric actuator comprising:  
a dielectric film structure according to claim  
5; and  
an electrode for applying voltage to said  
dielectric film structure.

20 12. A piezoelectric actuator comprising:  
a dielectric film structure according to claim  
8; and  
an electrode for applying voltage to said  
dielectric film structure.

25 13. An ink jet head comprising:  
a piezoelectric actuator including a dielectric

film structure according to claim 1 and an electrode for applying voltage to said dielectric film structure, and wherein said piezoelectric actuator is driven to discharge ink.

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14. An ink jet head comprising:

a piezoelectric actuator including a dielectric film structure according to claim 5 and an electrode for applying voltage to said dielectric film

10 structure, and wherein said piezoelectric actuator is driven to discharge ink.

15. An ink jet head comprising:

a piezoelectric actuator including a dielectric film structure according to claim 8 and an electrode for applying voltage to said dielectric film

15 structure, and wherein said piezoelectric actuator is driven to discharge ink.

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